

REMARKS

Reconsideration is respectfully requested of the Final Office Action of January 11, 2006, and entry of the current amendments is respectfully requested to place the application in immediate condition for allowance or for the purpose of appeal.

Claims 1-30 were pending in this application and have been rejected in the Office Action.

To summarize the claim changes made in this amendment, claim 1 and 13 have been amended and claims 25 and 27 have been canceled.

Claim 1 is amended to include all the feature of claim 25. Claim 13 is amended to include all the feature of claim 27. Claims 1 and 13 are also amended to change "control values" to "clutch torque values" corresponding to the Examiner's rejection, supported on page 3, lines 1-9. Claim 26 is amended to correct a minor error. No new matter is considered to be introduced by these amendments.

Summary of A Preferred Embodiment Present Invention To Facilitate Difference Discussion

There is provided a differential limiting control apparatus having a clutch between one shaft and another shaft, wherein a final clutch torque of the clutch is obtained by changing a ratio of a clutch torque provided through a feedback control method and a clutch torque provided through a feed forward control method, and the ratio changes according to the degree of diameter difference of tires.

(Page 3, line 11 - page 4, line 5)

The degree of diameter difference of tires means the degree of influence caused by the occurrence of the rotational speed differential triggered when there is a difference in tire air pressures or there exists mounted tires that are different in diameter.

(Page 2, lines 7-11)

The feedback control clutch torque computing unit computes the clutch torque by obtaining a deviation between the target differential speed and the actual differential speed.

(Page 4, lines 6-21)

The feed forward control clutch torque computing unit computes the clutch torque according to the throttle opening. In the preferred embodiment, as the throttle opening increases, the clutch torque increases.

(Page 45, line 2-9, Figure 6)

The clutch is disposed between a front axle and a rear axle, or a left wheel and a right wheel.

(Page 5, lines 13-24)

As the diameter difference of the tire increases, the ratio of the clutch torque provided through the feed forward control reduces and the ratio of the clutch torque provided through the feedback control increases.

(Page 4, line 22 – page 5, line 3, or page 49, line 14 – page 50, lines 3)

In the preferred embodiment, when the tire diameter difference is small, the clutch torque provided through the feedback control and the clutch torque provided through the feed forward control come to have the same or about the same ratio.

(Page 49, lines 8-14)

When the brakes are being applied, in order to avoid the interference with the brake condition, the clutch torque provided through the feed forward control is made to be zero.

(Page 45, lines 10-14)

In a preferred embodiment of the present invention, the feedback control and the feed forward control are clearly functionally independent from each other. Thus, for example, in a

feedback control, the throttle opening is not a reference source, and, in the feed forward control, the target differential speed and the actual differential speed are not used as a reference source.

As described heretofore, the clutch torque is set appropriately by reflecting the diameter difference of the tire to the clutch torque obtained through the feedback control. Therefore, in the preferred embodiment, the slippage can be avoided while suppressing the occurrence of the internal circulating torque and the tight corner breaking phenomenon.

(Page 51, lines 14-20)

Claim Rejections - 35 U.S.C. §112

Claims 1-30 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement.

In previously amended independent claims 1 and 13, the Examiner was of the position that a ration of clutch torque was disclosed in the application, but there was no disclosure of a ratio of control values between the feed forward control and feedback control. In this amendment, "control values" is changed to "clutch torque values".

Claim Rejections-35 U.S.C. §112

Claims 1-30 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In amended independent claims 1 and 13, the Examiner set forth that the limitations "effectively" and "adequately" were indefinite in "so as to effectively suppress a wheel slippage by adequately setting a ration of control values between the feed forward and feedback control".

In this amendment, these words are deleted as being extraneous.

In claim 26, the Examiner was saying that "the break signal" lacked antecedent basis. In this amendment, "the break signal" is corrected to "the break switch".

In claims 29 and 30, the Examiner set forth that "the final clutch torque" lacked antecedent basis. Applicants respectfully submit their base claims 1 and 13 include the phrase "a final clutch torque", such that there is submitted to be sufficient antecedent basis for this rejected term.

Claim Rejections-35 U.S.C. §102

Claims 1-30 were rejected under 35 U.S.C. §102(b) as being anticipated by Rodrigues et al (US 6,047,231). Applicants respectfully submit that Rodrigues fails to disclose or suggest the feature of the present invention.

In current amendment, Applicant has introduced the feature of claim 25 into claim 1, and the feature of claim 27 into claim 13 to make these claims in allowable condition. As a result, claims 1 and 13 comprises the distinguishable features below (with reference being made below to a preferred embodiment to facilitate the discussion of distinguishing features):

- a) The final clutch torque (Tl_{sd}) is computed by the clutch torque obtained through the feedback control (Tl_{sd}fb) and the clutch torque obtained through the feed forward control (Tl_{sd}ff).
- b) Tl_{sd}ff is computed based on a throttle opening.
- c) The ratio of Tl_{sd}fb and Tl_{sd}ff varies according to the diameter difference of the tire.

In Rodrigues, the word "feed forward" is not mentioned, but the following control method is disclosed.

It is known in a motor vehicle to sense or calculate a throttle position and use the input from the throttle position to prepare the transfer case for an anticipated load, conditioning the clutch for application. In a preferred embodiment, any throttle position compensation strategy

provided in the controller algorithm for 4 wheel drive operation is overridden during the spare tire sensing and qualification routines, or any such throttle position compensation must be below a calibratable duty. This ensures a quiet clutch during the spare tire routines. (Column 5, lines 20-29)

Paragraph above discloses that the throttle position compensation strategy is overridden or below a calibratable duty during the spare tire sensing and qualification routines. But there is no description that the throttle position compensation strategy is overridden or below a calibratable duty in Spare Tire Auto Mode Operation State 3, or another process after the spare tire is determined.

Furthermore, it is clearly understood that claims 1 and 13 of the present application concern a procedure after a tire having a different diameter is determined.

Therefore, Rodrigues does not disclose the currently claimed arrangement.

As for the Examiner's Rejection Discussion

New independent claim 1 is based on previous claims 1 and 25. Concerning previous claims 1 and 25, the Examiner set forth that all the features were disclosed in Rodrigues (pages 3-4, and 9 of the Office Action). A review of that disclosure and the Rodrigues reference in general reveals, however, that Rodrigues fails to disclose or suggest the claim 1 invention.

For example, Rodrigues does not disclose the following claimed combination:

(A) computing a final clutch torque by changing a ratio of the clutch torque obtained through the feedback control and the feed forward control according to the diameter difference of the tire, wherein the feed forward control is based on the throttle opening.

Regarding previous claim 1, the Examiner relies on the paragraph in column 6, lines 42-63; column 9, lines 1-21.

In column 6, lines 42-63, Rodrigues discloses that the controller is able to control the drivetrain to provide torque when the wheel are slipping at a low rate of slip buildup (such as in sand) regardless of a spare tire by considering the maximum wheel slipping expected for a spare tire. Column 3, line 66 – column 4, line 11 discloses the similar method. This method means to change the threshold level of the slippage judging if a spare tire is present.

In column 9, lines 1-21, Rodrigues only shows the difference of effective diameter between the normal tire and a spare tire or a low pressure tire.

Regarding previous claim 25, the Examiner relies on the paragraph in abstract, figs. 1-4, column 2, lines 54 – column 3, lines 1-40 and column 4-9.

Described above, there is no disclosure about the control according to the throttle opening except Column 5, lines 20-29, which, as discussed above, pertains to spare tire sensing and qualification routines.

Accordingly, there is no description about the claimed combination (A) set out above in the paragraphs referenced in the Office Action.

Therefore, Rodrigues does not disclose the present independent claim 1.

New independent claim 13 is based on previous claim 13 and 27. Applicant's remark shown above also are applicable to claim 27, now rewritten in independent form as claim 13. Therefore, Rodrigues does not disclose the feature of new independent claim 13.

Conclusion

As a whole, Applicants respectfully submit that Rodrigues fails to disclose or suggest the feature of new independent claims 1 and 13, and independent claims 1 and 13 and these respective dependent claims are patentable over Rodrigues.

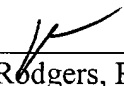
U.S. Appln. No. 10/667,396

If any fees are due in connection with the filing of this Amendment, such as fees under 37 C.F.R. §§1.16 or 1.17, please charge the fees to Deposit Account 02-4300; Order No. 032405.156.

Respectfully submitted,

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